REMARKS

I. Introduction

In response to the final Office Action dated December 9, 2009, Applicants have amended claims 1 and 9 in order to further clarify the subject matter of the present disclosure. Support for the amendment to claim 1 may be found, for example, in original claims 5-7. New claims 17 and 18 have been added. Support for the amendment to claim 9 and for new claims 17 and 18 may be found, for example, in the deleted portions of claim 1. In addition, claims 5-7 have been cancelled, without prejudice. No new matter has been added.

A Request for Continued Examination (RCE) is being filed concurrently with this Amendment.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection Of Claims 1-3 And 5-16 Under 35 U.S.C. § 103

Claims 1-3, 5-10, 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki et al. (US 2002/0037450) in view of Delnick (USP No. 5,948,464); claim 11 as being unpatentable over Suzuki in view of Delnick and further in view of Ota et al. (USP No. 6,365,300); claim 12 as being unpatentable over Suzuki in view of Delnick and further in view of Hampden-Smith et al. (US 2002/0168570); and claims 15-16 as being unpatentable over Suzuki in view of Delnick and further in view of Daroux et al. (USP No. 6,562,511). As the limitations of claims 5-7 have been incorporated into independent claim 1, Applicants will address the rejections of claims 5-7 when referring to amended independent claim 1. Applicants

respectfully submit that Delnick, Suzuki, Ota, Hampden-Smith and Daroux fail to render the pending claims obvious for at least the following reasons.

With regard to the present disclosure, amended independent claim 1 recites, in part, a lithium ion secondary battery having a porous film comprising an inorganic filler and a first binder. A content of the first binder in said porous film is 1.5 to 8 parts by weight per 100 parts by weight of said filler. The first binder comprises a first rubber of an acrylonitrile unit, and the first rubber is water-insoluble and having a decomposition temperature of 250°C or higher. In addition, the battery contains a negative electrode comprising a negative electrode active material capable of absorbing and desorbing lithium ion and a second binder. The second binder includes a second rubber particle including a styrene unit and a butadiene unit and a water-soluble polymer including a methylcellulose unit. The content of the second binder in the negative electrode is 1.5 to 3 parts by weight per 100 parts by weight of the negative electrode active material.

One feature of the present disclosure is the use of a second binder comprising a second rubber particle including a styrene unit and a butadiene unit and a water-soluble polymer including a methylcellulose unit. The content of the second binder in the negative electrode is 1.5 to 3 parts by weight per 100 parts by weight of the negative electrode active material.

It is alleged that Suzuki teaches a binder for a negative electrode containing carboxymethylcellulose and styrene-butadiene rubber with 1.6 parts per 100 parts active material. Applicants respectfully disagree. Suzuki does not appear to teach this limitation. Applicants would point out that the Office Action fails to show a page and line number in Suzuki where this limitation allegedly occurs. Review of Suzuki only shows that Suzuki describes the use of 3 parts of styrene-butadiene rubber and 1.3 parts carboxymethylcellulose (see, paragraph

[0076] of Suzuki. As such, Suzuki teaches 4.3 (3 + 1.3) parts by weight per 100 parts by weight of carboxymethylcellulose and styrene-butadiene rubber in the negative electrode active material. Therefore Suzuki fails to teach or suggest that the content of the second binder in the negative electrode is 1.5 to 3 parts by weight per 100 parts by weight of the negative electrode active material.

Moreover, the above limitation exhibits superior, unexpected results. As is shown on page 41, lines 11-24 of the specification, when the second binder exceeds 3 parts/100 parts by weight, the surface of the negative electrode active material is excessively covered with the second binder, so the lithium ion acceptance decreases. This promotes the deposition of lithium metal in the porous film and hence, the occurrence of short circuits. This is shown in Table 1 by the comparison between batteries X1-X3 and Y2.

Another feature of the present disclosure is that the porous film formed on the negative electrode surface contains a binder including a first rubber, and the first rubber includes an acrylonitrile unit and has a decomposition temperature of 250 °C or higher. In this case, even when a large amount of heat is generated by a short circuit caused by nail penetration, the porous film is not easily burned out or melted (see, page 66, line 23 to page 67, line 5 of the specification). This is shown in Table 4 which compares nail penetration safety data of battery A2 and B10.

Moreover, the combination of Suzuki and Delnick is improper. It is admitted that Delnick fails to disclose the claimed first binder of claim 1. However, it was found that Suzuki discloses core-shell type rubber particle comprising an acrylonitrile unit in a positive electrode. As such, it is alleged that the combination of Delnick and Suzuki teach or suggest the limitations of claim 1. Applicants respectfully disagree.

Suzuki states, in paragraphs [0006] to [0008] that "when PVDF is used as a binder for a positive electrode active material, a large amount of PVDF is necessary. In this case, the large amount of the binder covers the positive electrode active material, so the addition of a large amount of conductive material is necessary to obtain good cycle life. The addition of a large amount of conductive material results in a decrease in battery capacity." To solve this problem, Suzuki uses core-shell particles (rubber particles) as the positive electrode binder.

However, in Delnick, a separator containing a binder such as a polyvinylidene fluoride-hexafluoropropylene copolymer and inorganic particles is formed on an electrode surface in order to obtain a thin separator. The inorganic particles contained in the separator are not required to provide conductivity. Thus, there is no reason to consider the ratio of the binder covering the surface of the inorganic particles contained in the separator. Delnick is also silent concerning the ratio of the binder covering the inorganic particles. Therefore, one skilled in the art would not be motivated to use the core-shell particles used as the positive electrode binder of Suzuki as the separator binder of Delnick.

Moreover, Hampden-Smith, Ota, and Daroux do not, and are not relied upon to remedy these deficiencies.

Therefore, as is well known, in order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. As Delnick, Suzuki, Ota, Hampden-Smith and Daroux do not disclose lithium ion secondary battery comprising: a porous film which comprises an inorganic filler and a first binder, a content of the first binder in the porous film being 1.5 to 8 parts by weight per 100 parts by weight of the filler, the first binder comprises a first rubber of an acrylonitrile unit, the first rubber being water-insoluble and having a decomposition temperature of 250°C or higher, the negative electrode

comprises a negative electrode active material capable of absorbing and desorbing lithium ion and a second binder, the second binder includes a second rubber particle including a styrene unit and a butadiene unit and a water-soluble polymer including a methylcellulose unit, and a content of the second binder in the negative electrode is 1.5 to 3 parts by weight per 100 parts by weight of the negative electrode active material, it is apparent that Delnick, Suzuki, Ota, Hampden-Smith and Daroux fail to render amended claim 1 or any dependent claims thereon obvious. Accordingly, the Applicants respectfully request that the § 103 rejection be withdrawn.

III. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as amended claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

IV. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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